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ENTERPRISES

HPD PULSER UPGRADE TO IMPROVE RISE TIME

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Presented to the
AMEREM
31 May 1996

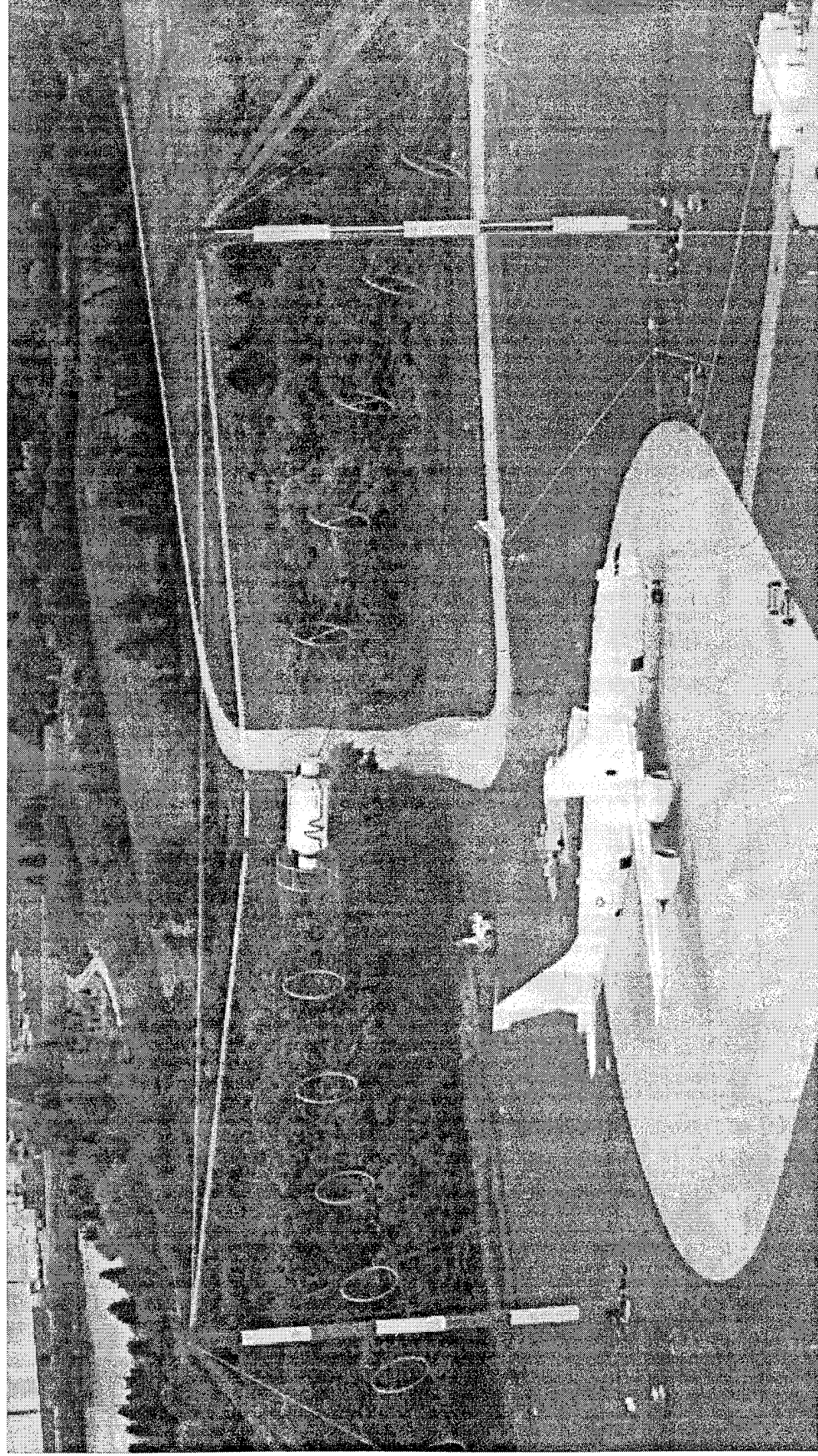
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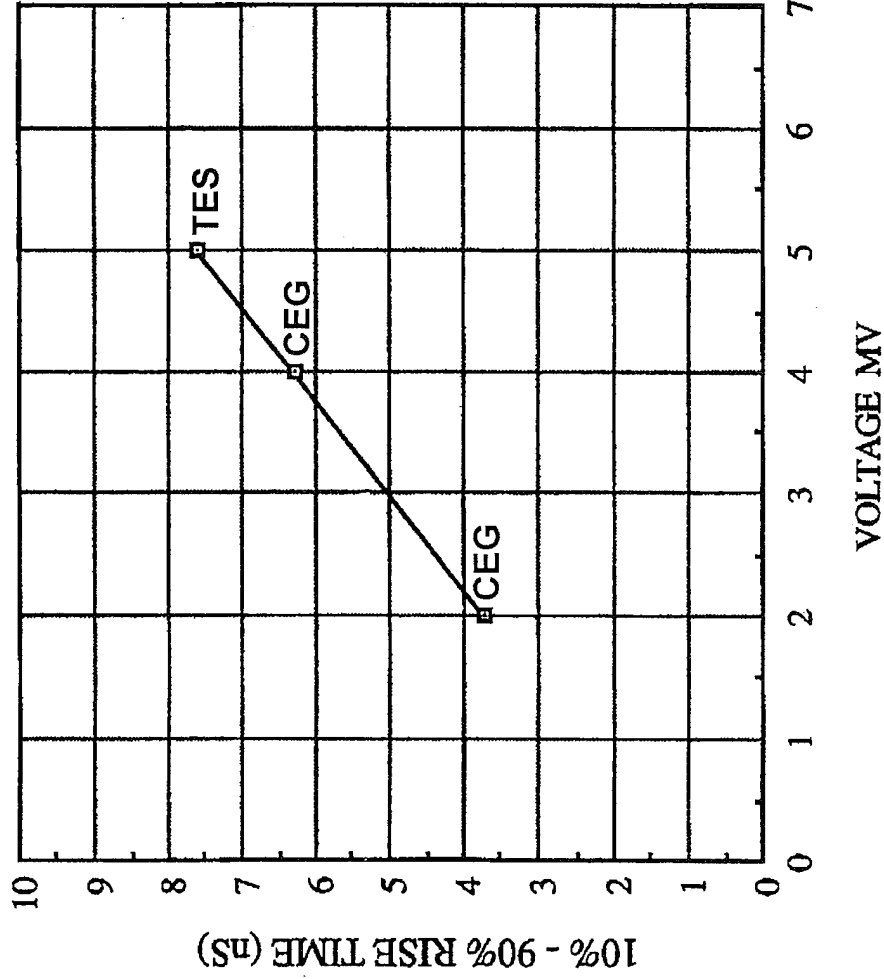


HORIZONTALLY POLARIZED DIPOLE FACILITY





RISE TIME OF CONVENTIONAL SF₆ FILLED GAS SWITCH



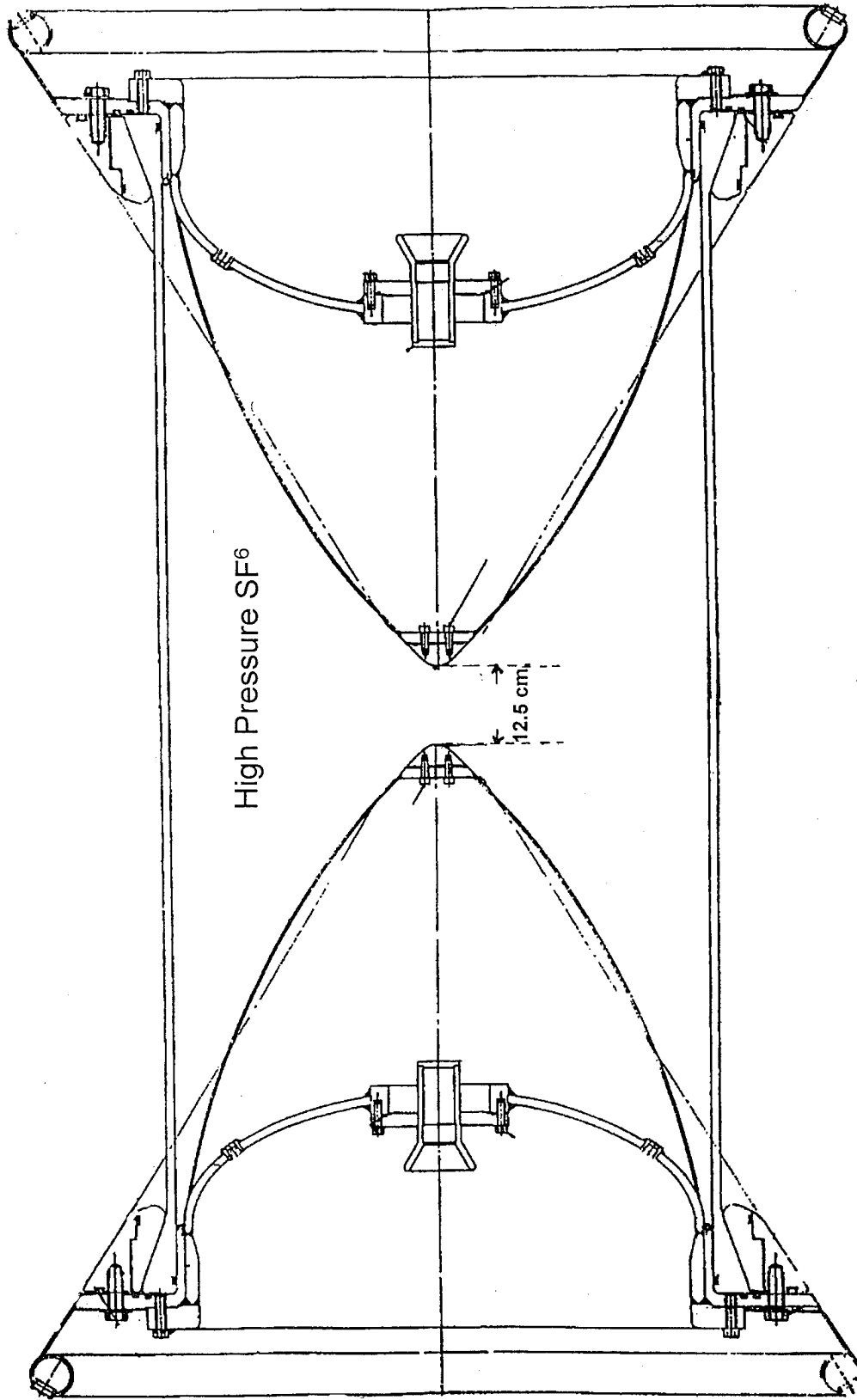


ORIGINAL SF₆ FILLED OUTPUT SWITCH

M.M.L.I.



AND
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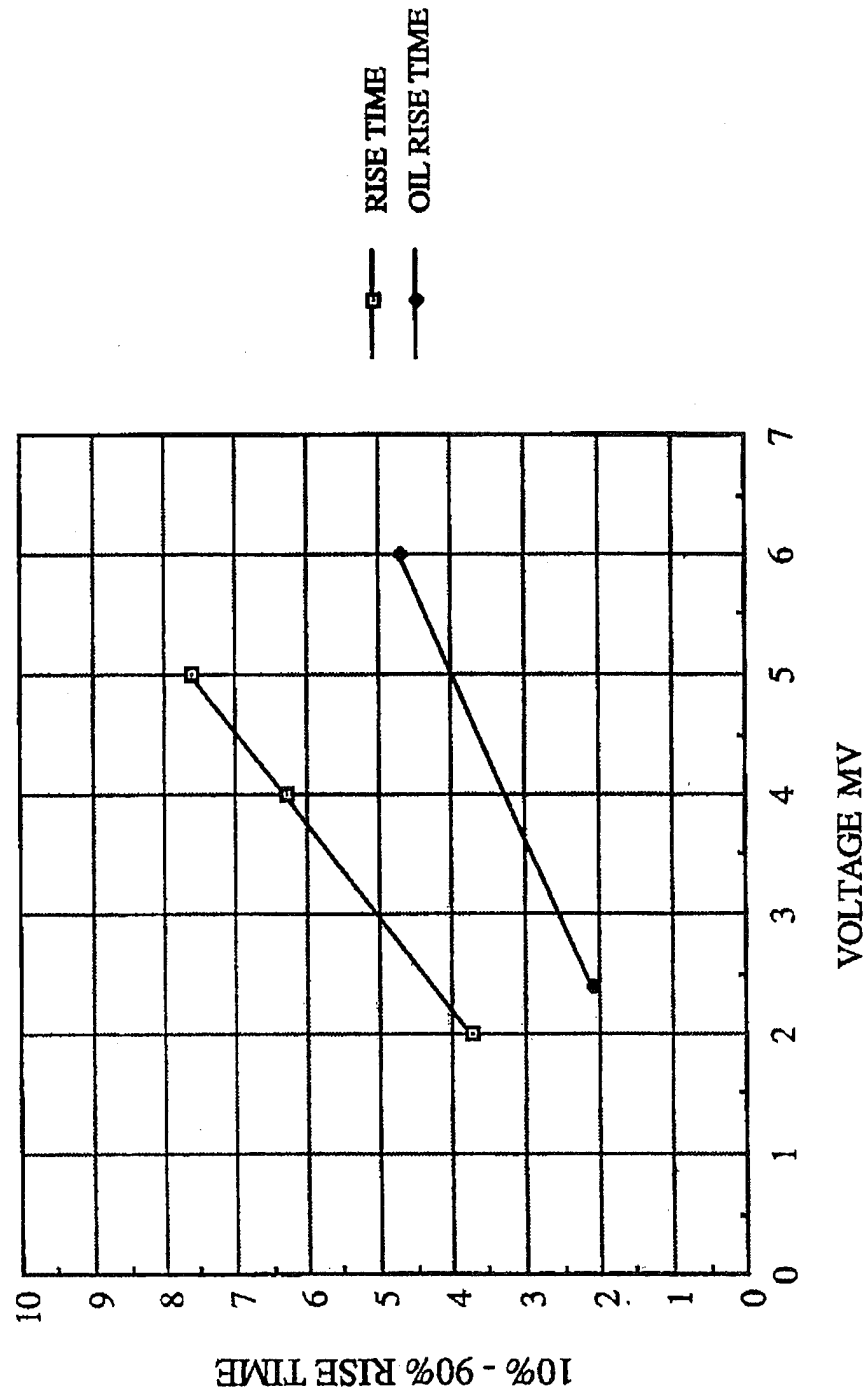




EXPECTED OIL SWITCH RISE TIME

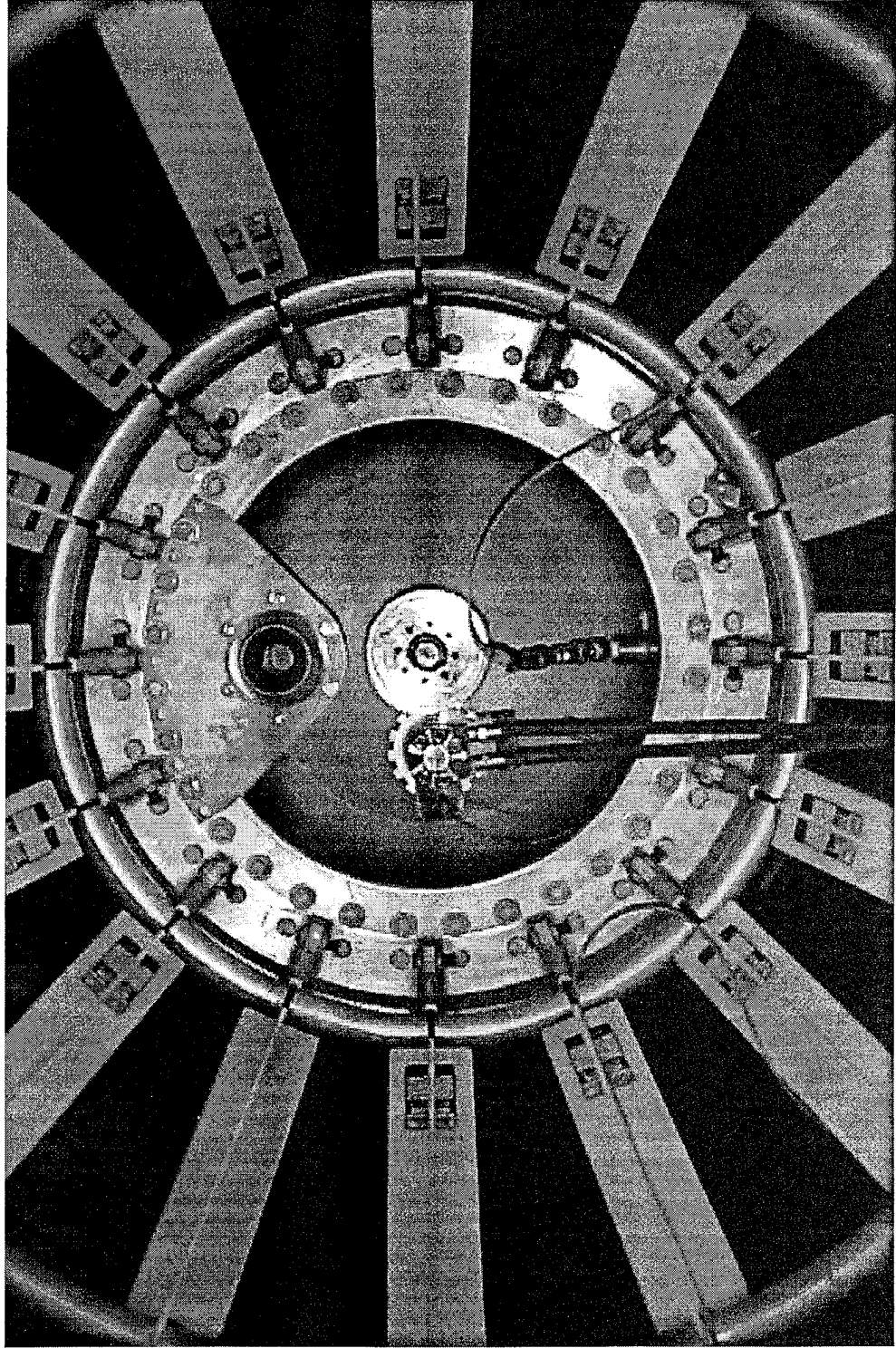
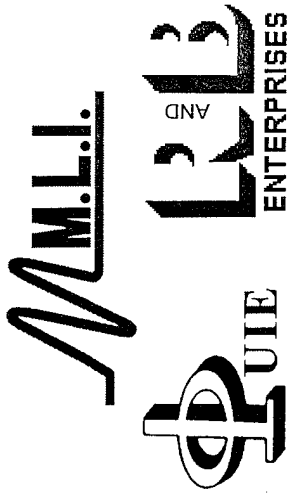
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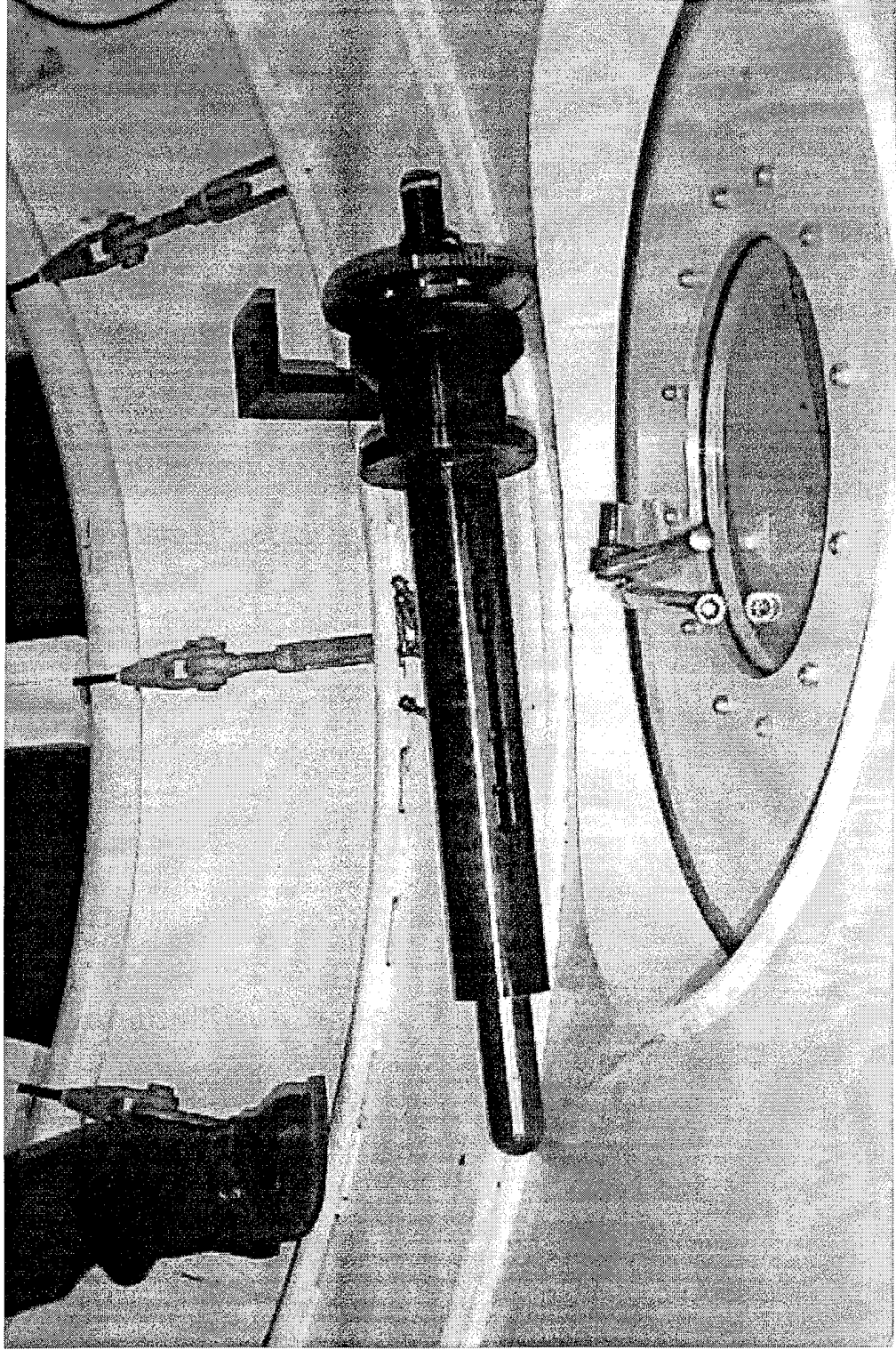
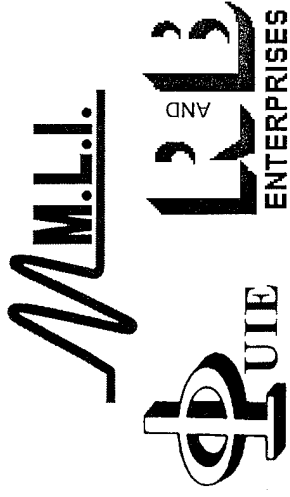


GAP ADJUSTMENT



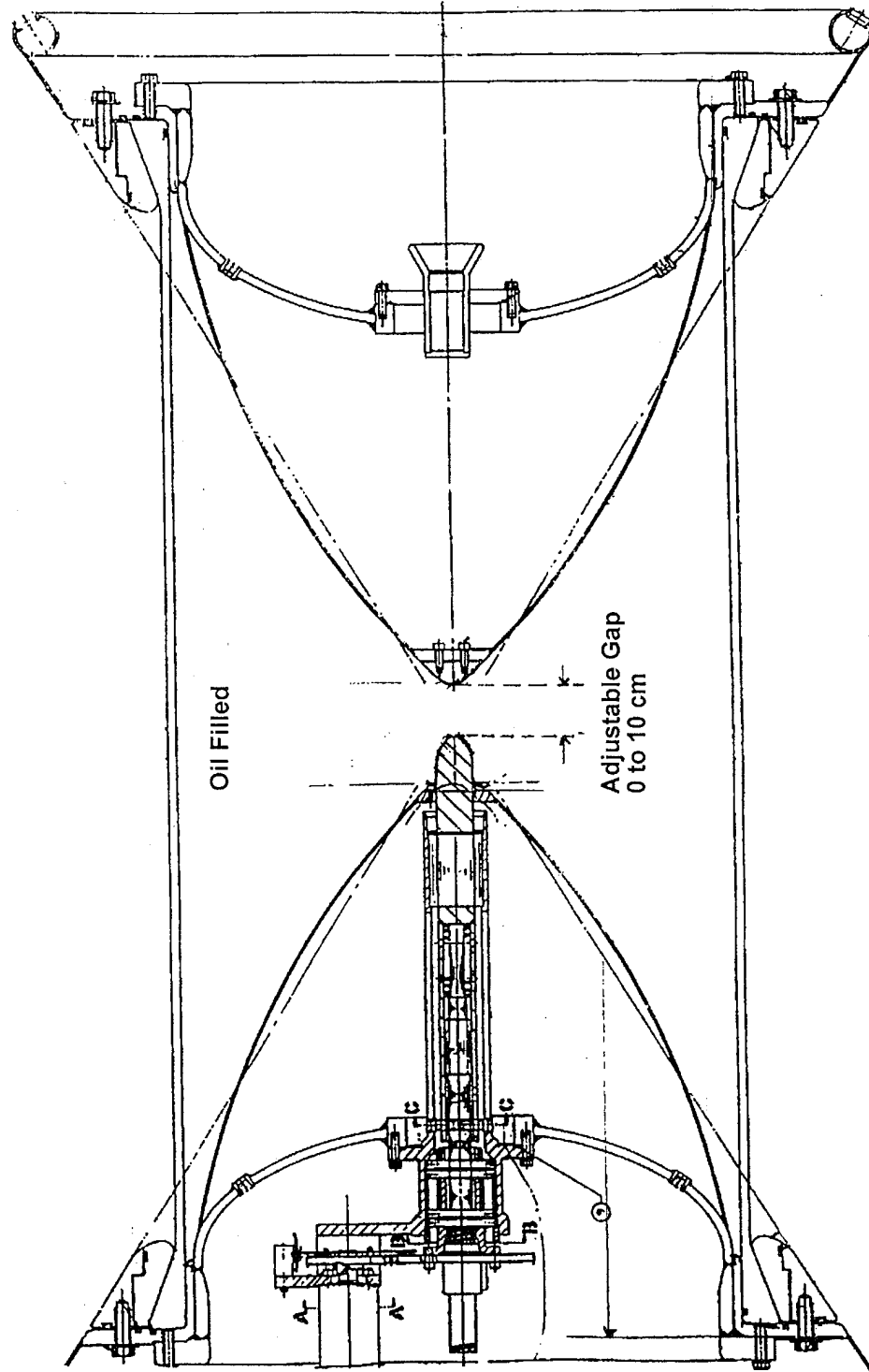
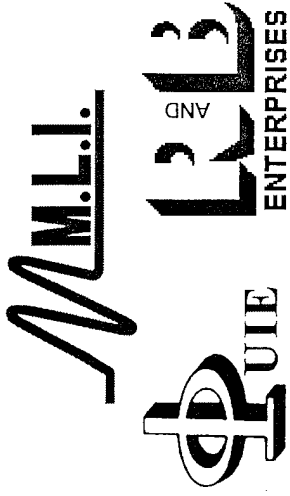


MOVABLE ELECTRODE



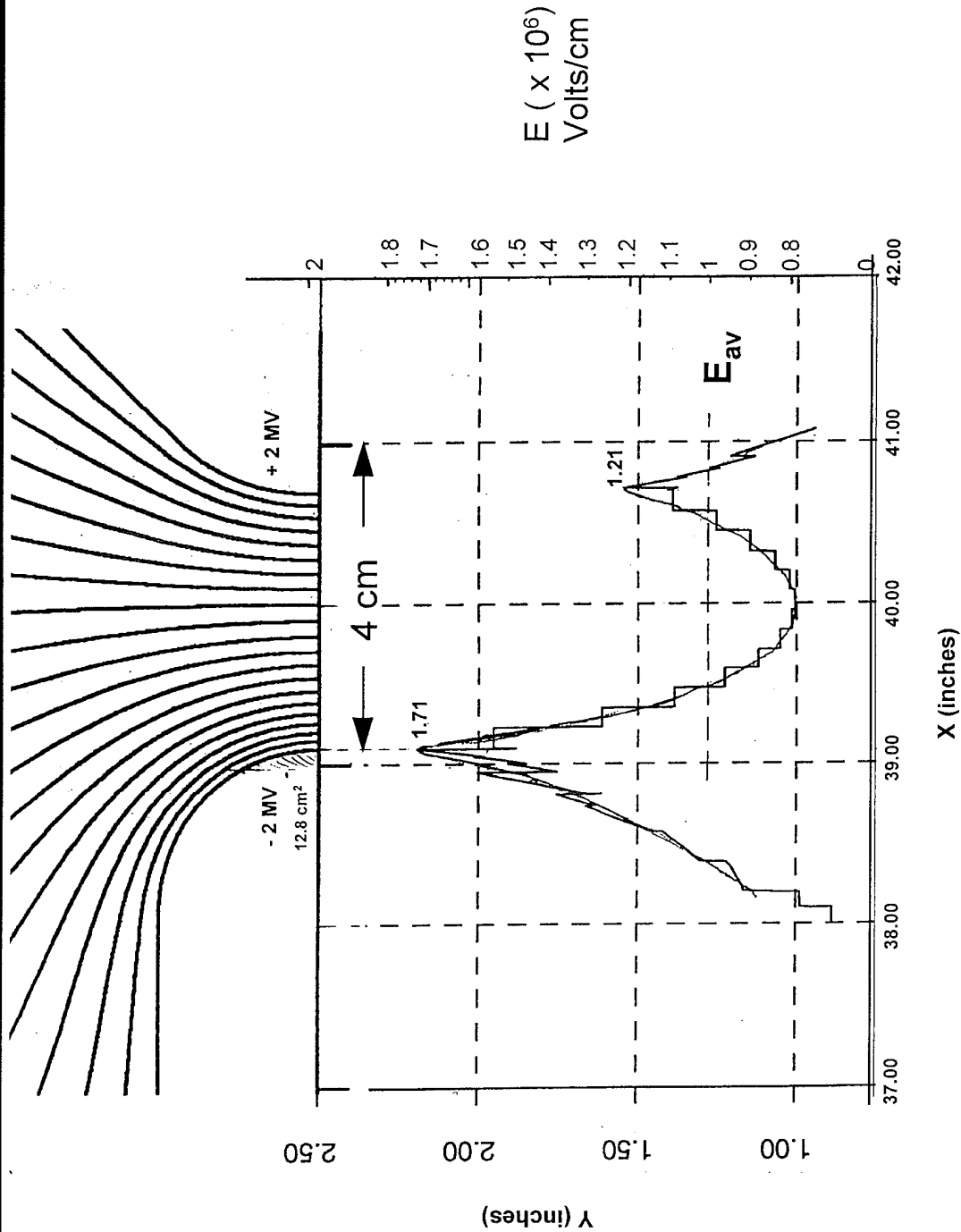
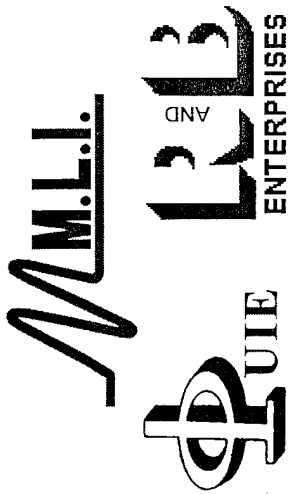


OIL FILLED OUTPUT SWITCH



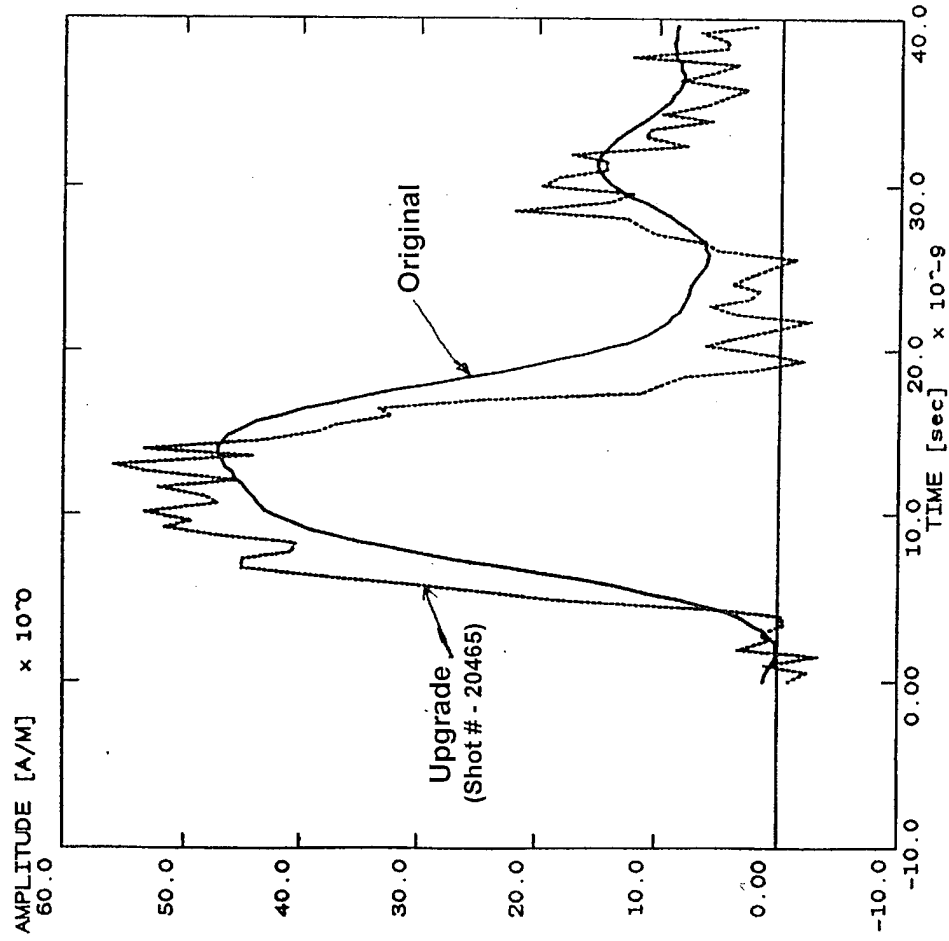


4 CM OIL GAP FIELD PLOT





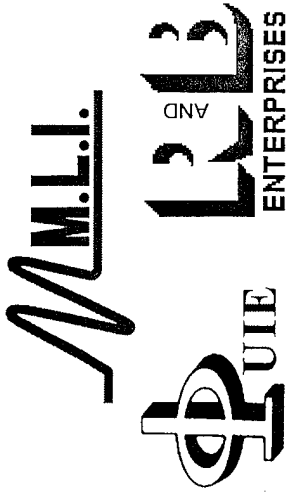
PRELIMINARY FIELD MEASUREMENT DATA



Rise Time Improved
From 7.8 ns to 3.5 ns



FAST RISING PULSE OIL BREAKDOWN



Generally Accepted Fast Rising Positive Field Oil Breakdown

$$F_{BD}^{+} = \frac{0.49}{t_e^{1/3} \cdot A_e^{1/13.7}}$$

Substitute:

$$t_e = 0.05 \mu s, A_e = 5 \text{ cm}^2$$

$$F_{BD}^{+} = 1.183 \text{ MV/cm}$$

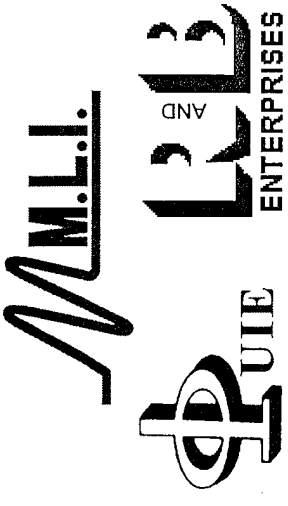
TES Upgrade Oil Switch

V = 4 MV, Gap = 4.14 cm

Peak Field at Positive Electrode Tip = 1.178 MV/cm



CONCLUSION



1. The Goal of Improving TES Pulser Rise Time to Better Than 4 ns Has Been Achieved.
2. The Upgraded Oil Field Output Switch Can Now Deliver Better Than:

1 ns/MV 10% - 90% Rise Time Pulse
3. Risetime Can Be Varied By Controlling Pulser Charge Voltage.



FIELD MEASUREMENTS

M.M.L.I.

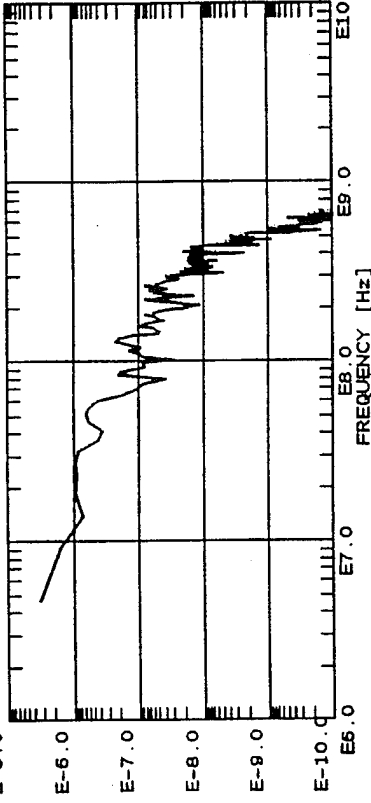


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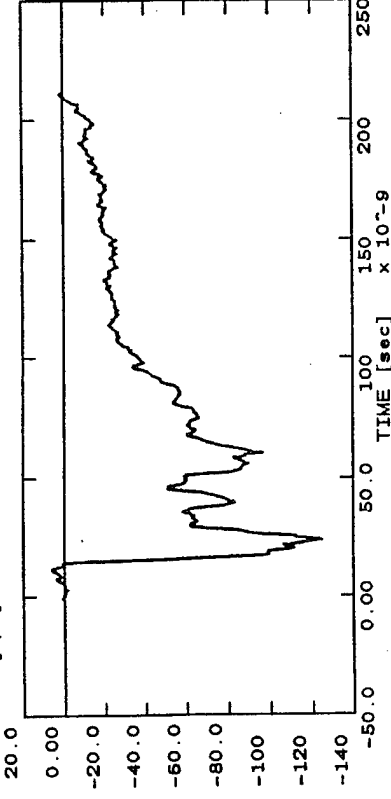
CORRECTED FIELD MAP DATA

7-MAY-96 10:15:05 FILE: DAS_DATA:ISCMGL2D_0023_02_1_1.RAW

MAGNITUDE [A/M/Hz]
E-5.0



AMPLITUDE [A/M] x 10¹⁰

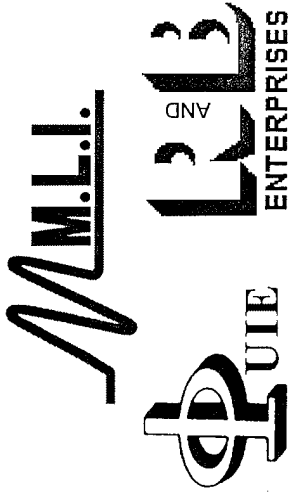


Test ID	FIELD_MAP
Experiment Number	1
Pulse Number	20573
Pulse Date	17-APR-1996 14:39:50
Ref Field [kV/m]	0.0000
Rise Time [sec]	23.52 E-09
Measurement Type	HZ
Measurement Priority	A
Probe type	MGL-6
Probe Eu Conv. factor	1.260 E-09
Transmitter Gain [db]	-21
Total Scalar Gain	-231
Peak [A/M]	-124.4
10%-70% Time [sec]	1.891 E-09
Signal/Noise Ratio [dB]	45
Projected Rise Time [sec]	2.521 E-09
Decay Time (1/e) [sec]	67.95 E-09

%E	Alpha	Beta	Delay
82.1	7.498 E+06	14.10 E+06	4.4E-08
%E	Freq (Hz)	Amplitude	Q
78.0	4.702 E+06	168.5	0.6
			Delay
			1.7E-07



FIELD MEASUREMENTS

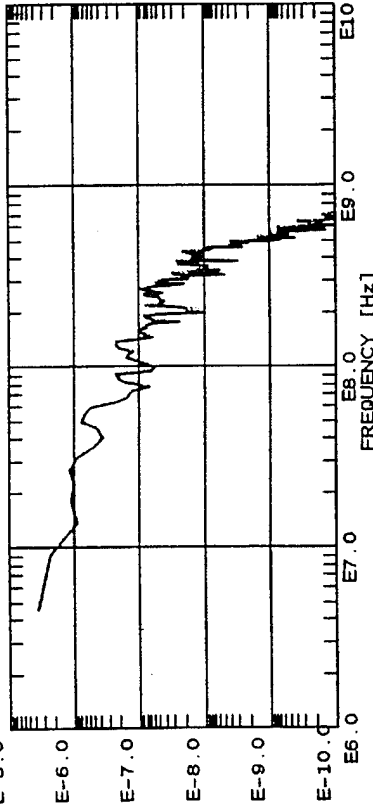


CORRECTED FIELD MAP DATA

7-MAY-96 10:16:24

FILE: DAS_DATA:ISCMGL2D_0024_02_1_RAW

MAGNITUDE [A/M/Hz]
E-5.0



Test ID

Experiment Number

Pulse Number

Pulse Date

Ref Field [kV/m]

Rise Time [sec]

Measurement Type

Measurement Priority

Probe type

Probe Eu Conv. factor

Transmitter Gain [dB]

Total Scalar Gain [dB]

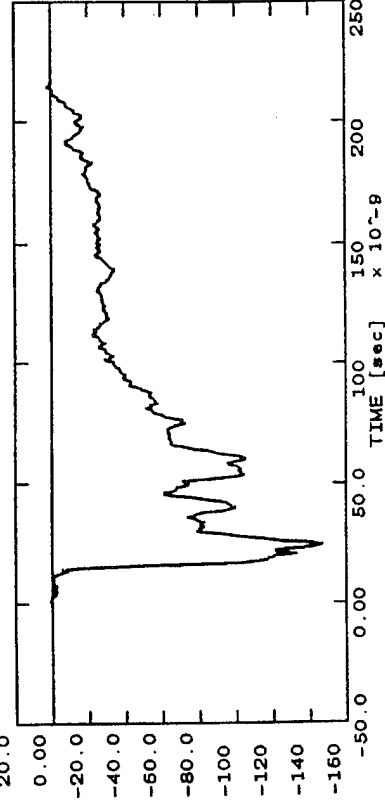
Peak [A/M]

Signal/Noise Ratio [dB]

Projected Rise Time [sec]

Decay Time (1/e) [sec]

AMPLITUDE [A/M] x 10¹⁰



FIELD_MAP

20574

17-APR-1996 14:45:35

0.0000

32.86 E-09

HZ

A

MGL-6

1.260 E-09

-21

-231

-146.7

1.928 E-09

42

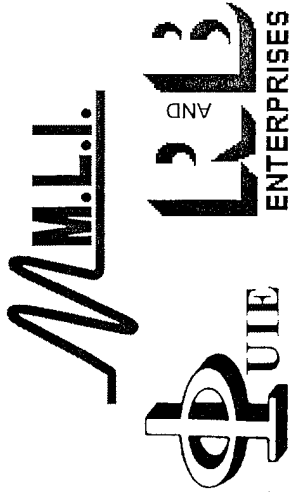
2.571 E-09

62.51 E-09

%E	Alpha	Beta	Delay
88.2	8.402 E+06	13.80 E+06	1.1E-08
%E	Freq (Hz)	Amplitude	Q
71.5	4.601 E+06	-140.0	0.8
			5.7E-08



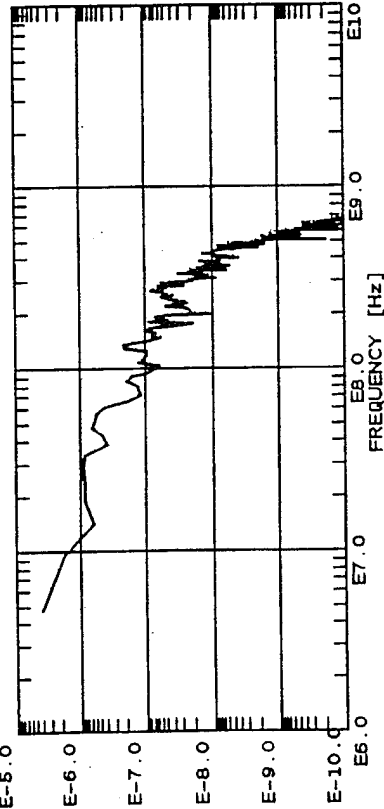
FIELD MEASUREMENTS



CORRECTED FIELD MAP DATA

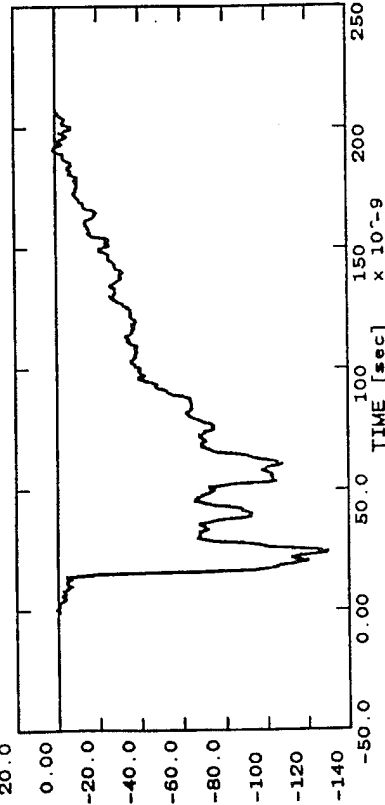
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MAGNITUDE [A/M/Hz]



Test ID	FIELD_MAP
Experiment Number	1
Pulse Number	20575
Pulse Date	17-APR-1996 14:58:51
Ref Field [kV/m]	0.0000
Rise Time [sec]	45.63 E-09
Measurement Type	HZ
Measurement Priority	A
Probe type	MGL-6
Probe Eu Conv. factor	1.260 E-09
Transmitter Gain [dB]	-21
Total Scalar Gain [dB]	-231
Peak [A/M]	-129.3
Signal/Noise Ratio [dB]	1.923 E-09
Projected Rise Time [sec]	40
Decay Time (1/e) [sec]	2.564 E-09
	70.17 E-09

AMPLITUDE [A/M] x 10⁰



XE	Alpha	Beta	Delay
100.8	7.449 E+06	14.46 E+06	4.3E-08